Apr 5th, 10:30 AM - 10:45 AM

Marine shoreline armor in King County, 2005-2015

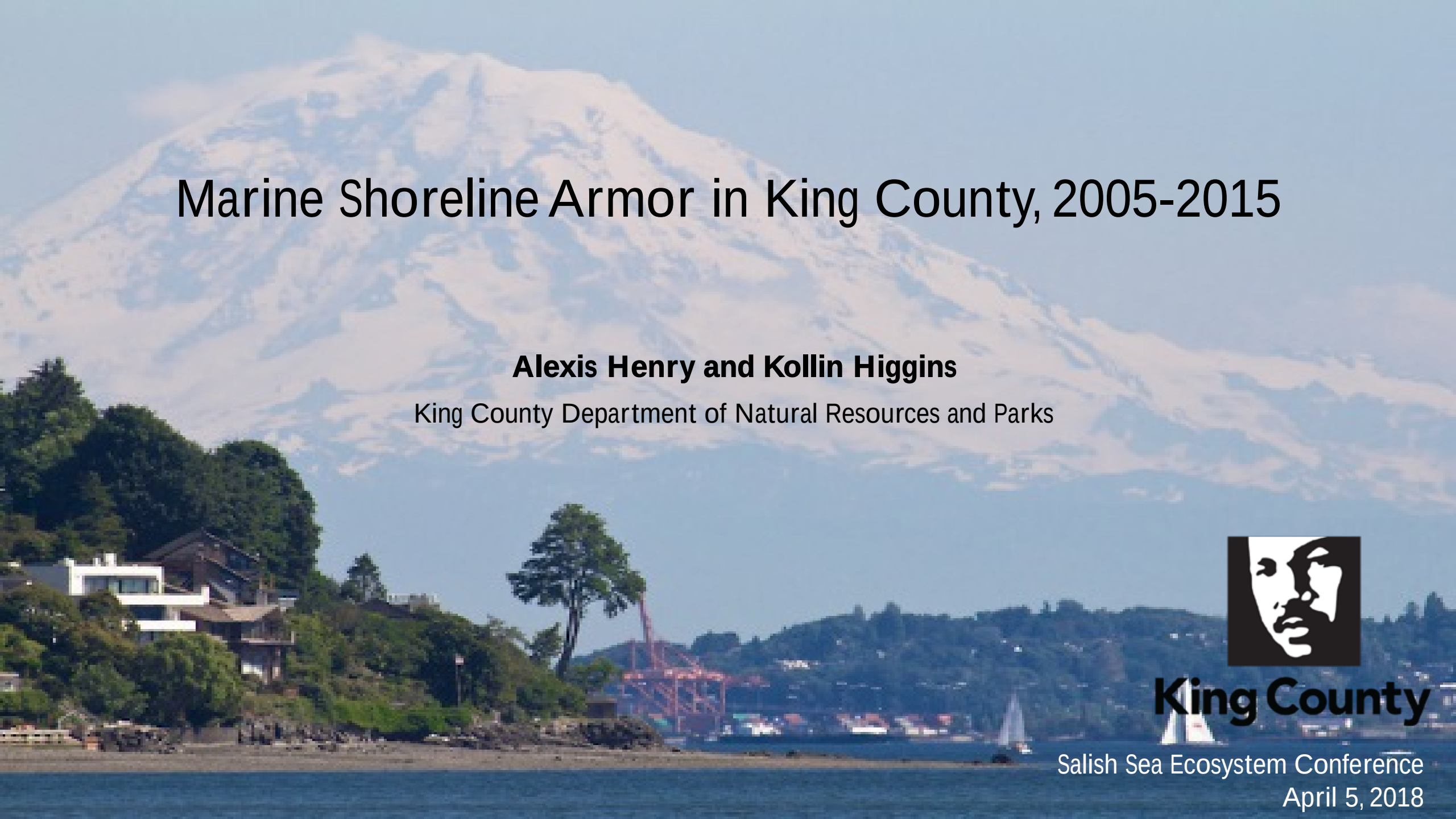
Alexis Henry
King County, United States, alexis.henry@kingcounty.gov

Kollin Higgins
King County, United States, Kollin.higgins@kingcounty.gov

Marine Shoreline Armor in King County, 2005-2015

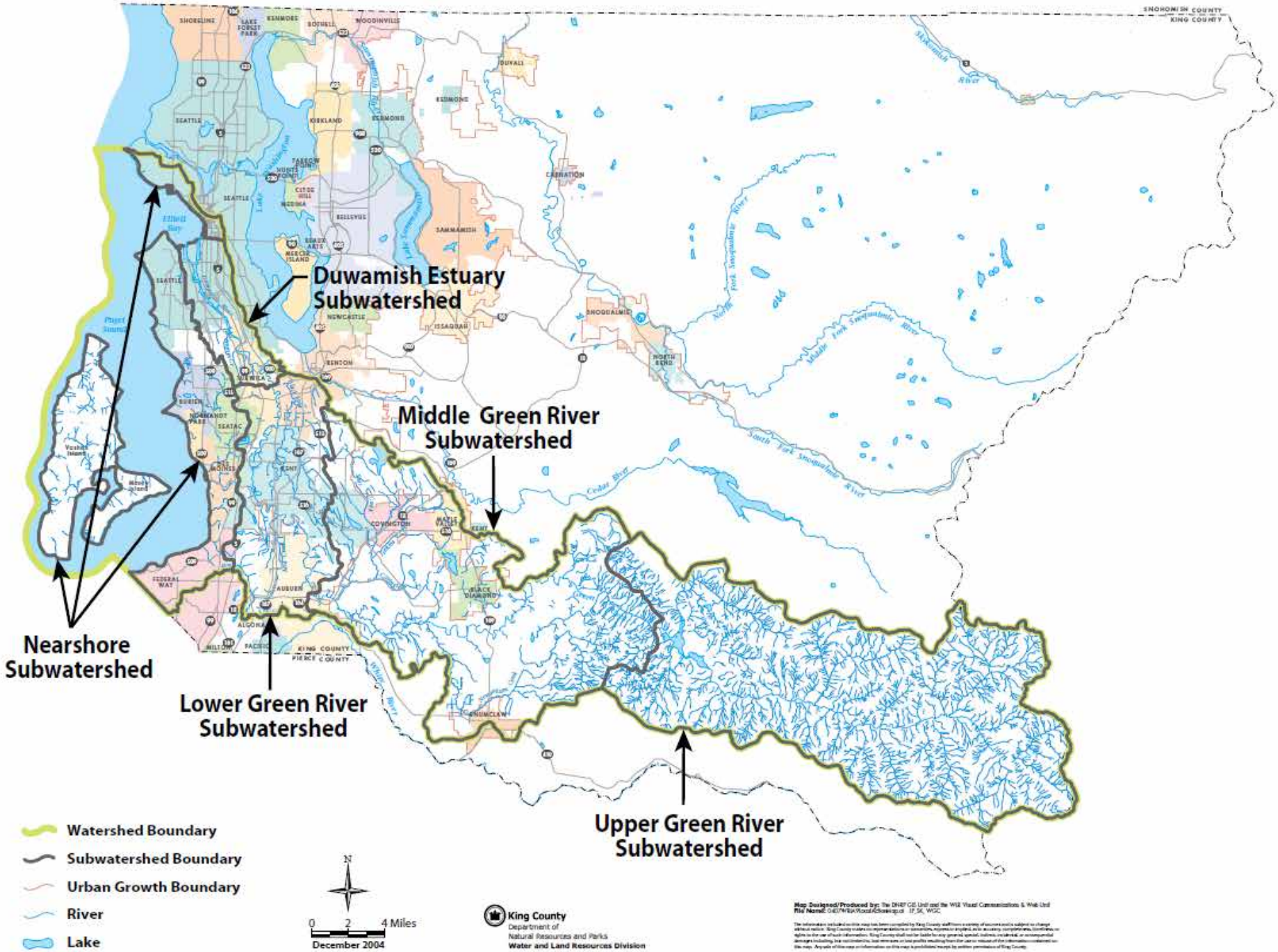
Alexis Henry and Kollin Higgins

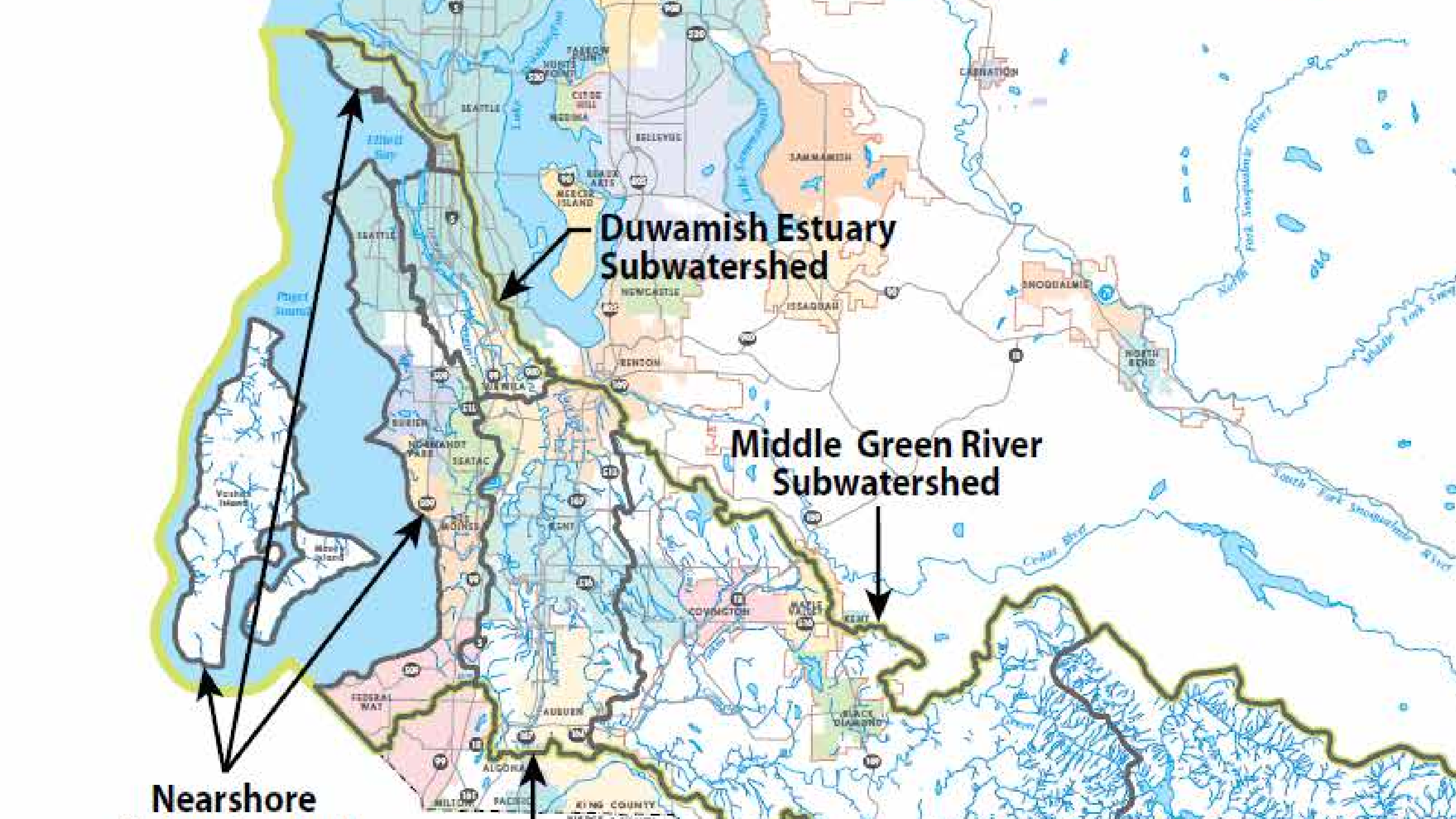
King County Department of Natural Resources and Parks

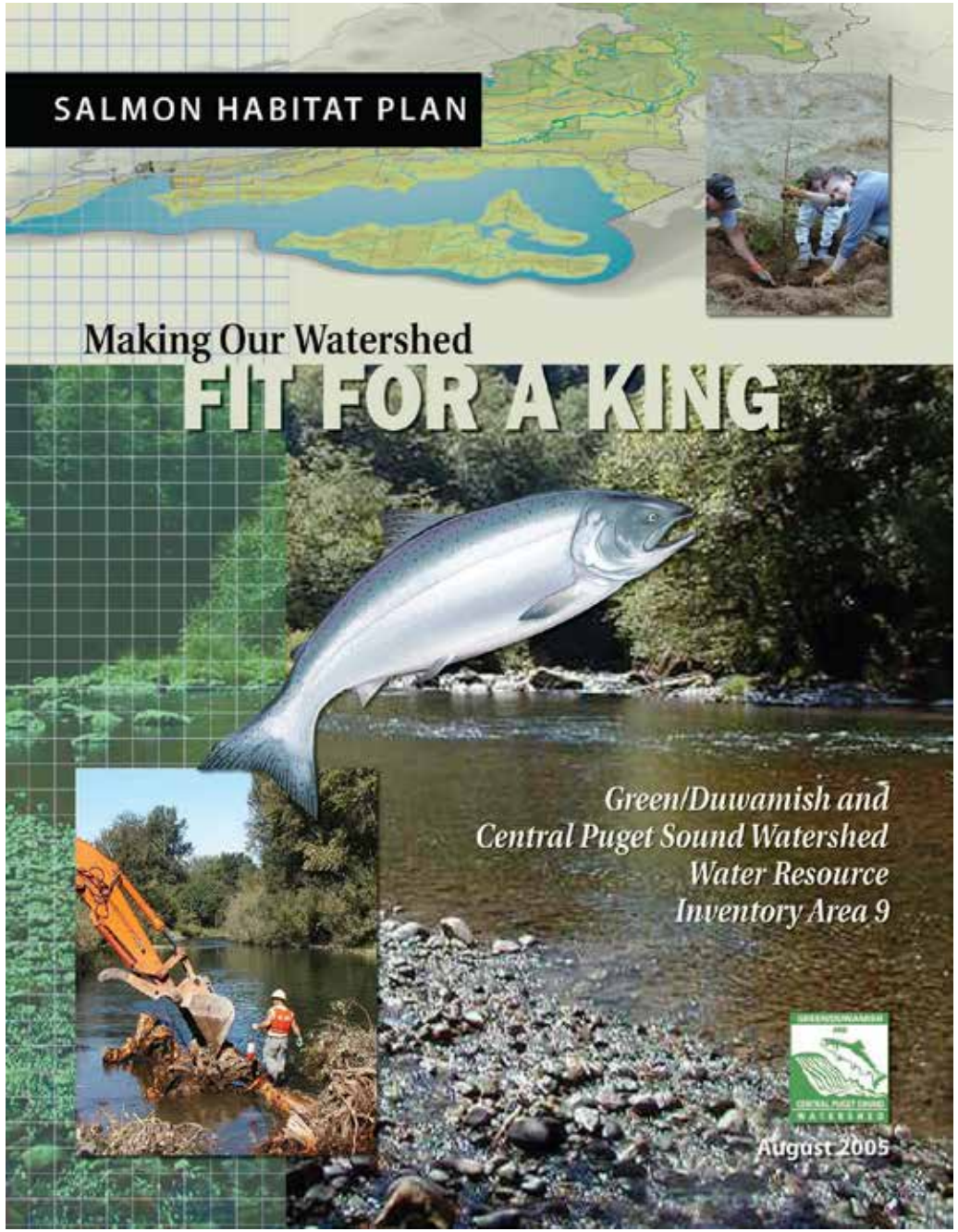


King County

Salish Sea Ecosystem Conference
April 5, 2018


Duwamish Estuary Subwatershed
Middle Green River Subwatershed
Nearshore Subwatershed
Lower Green River Subwatershed
Upper Green River Subwatershed
Watershed Boundary
Subwatershed Boundary
Urban Growth Boundary
River
Lake
N
0 2 4 Miles
December 2004
King County
Department of Natural Resources and Parks
Water and Land Resources Division


Duwamish Estuary
Subwatershed
Middle Green River
Subwatershed
Nearshore



Conservation Hypothesis (Nearshore 2)

Protecting and increasing the availability of vegetated shallow nearshore and marsh habitats will enhance habitat quantity and quality and lead to greater juvenile salmon residence time, greater growth, and higher survival.

WRIA 9 Status and Trends Monitoring Report: 2005-2010

Prepared by the
WRIA 9 Implementation
Technical Committee

Prepared for the WRIA 9
Watershed Ecosystem Forum

February 2012

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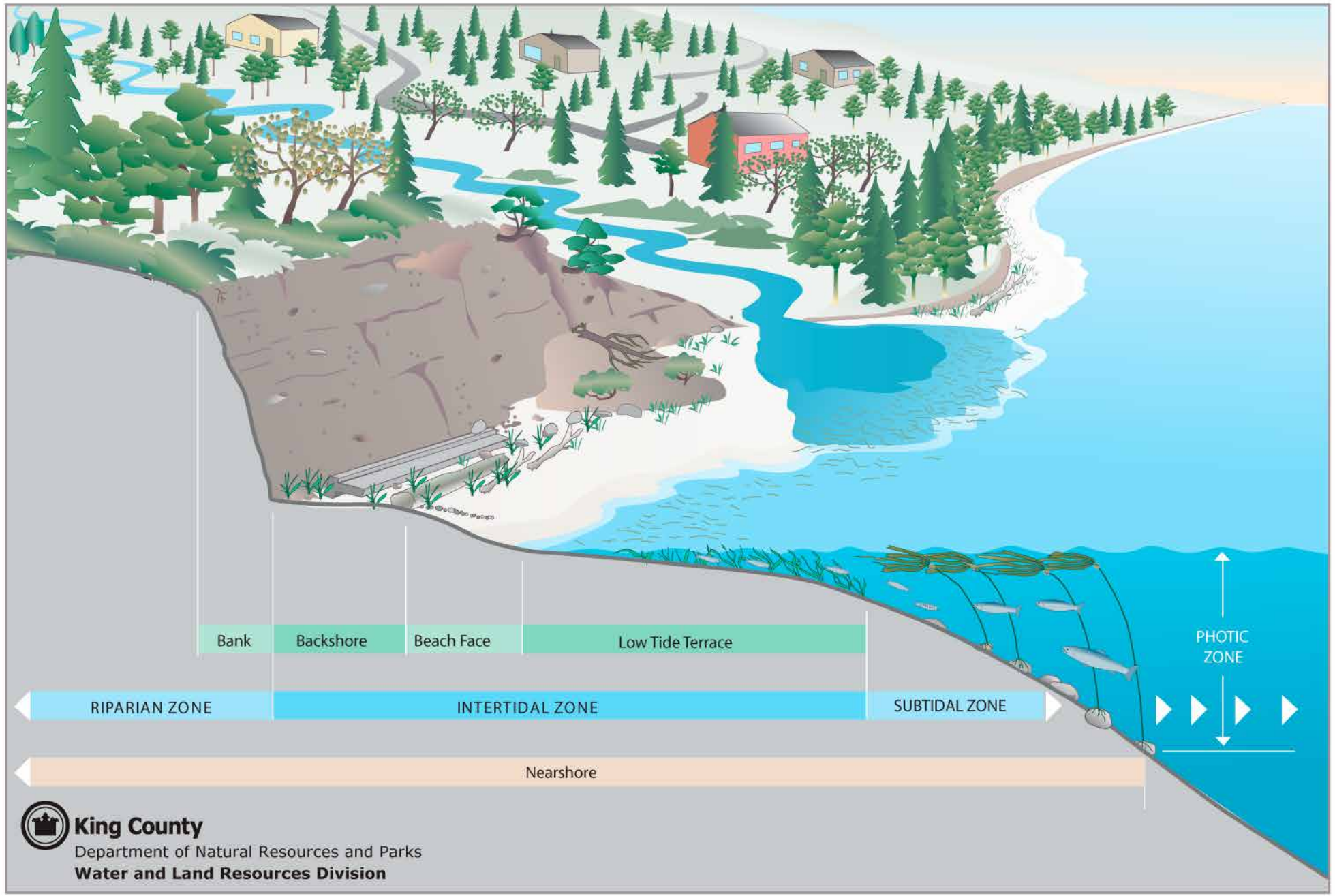
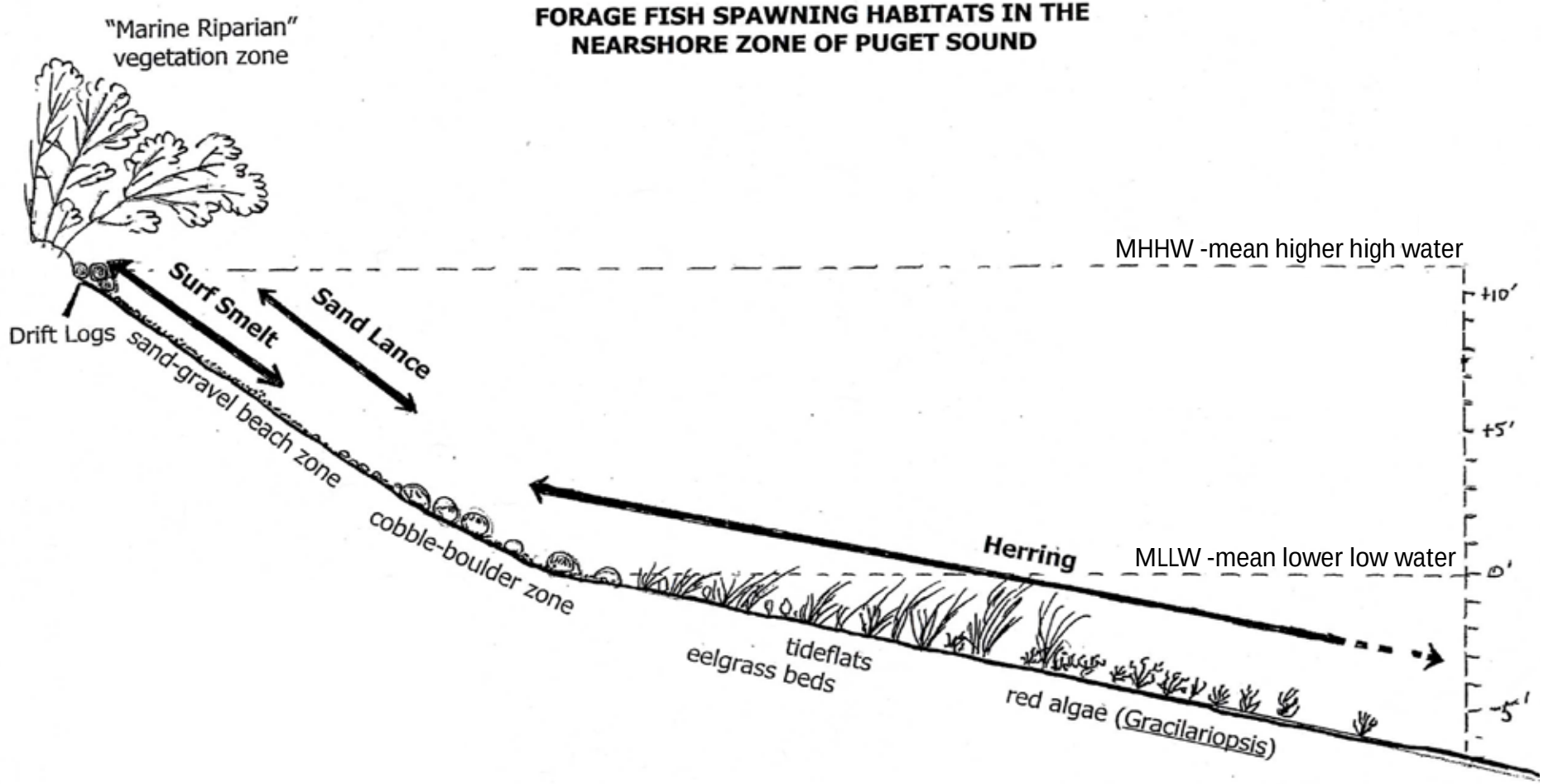
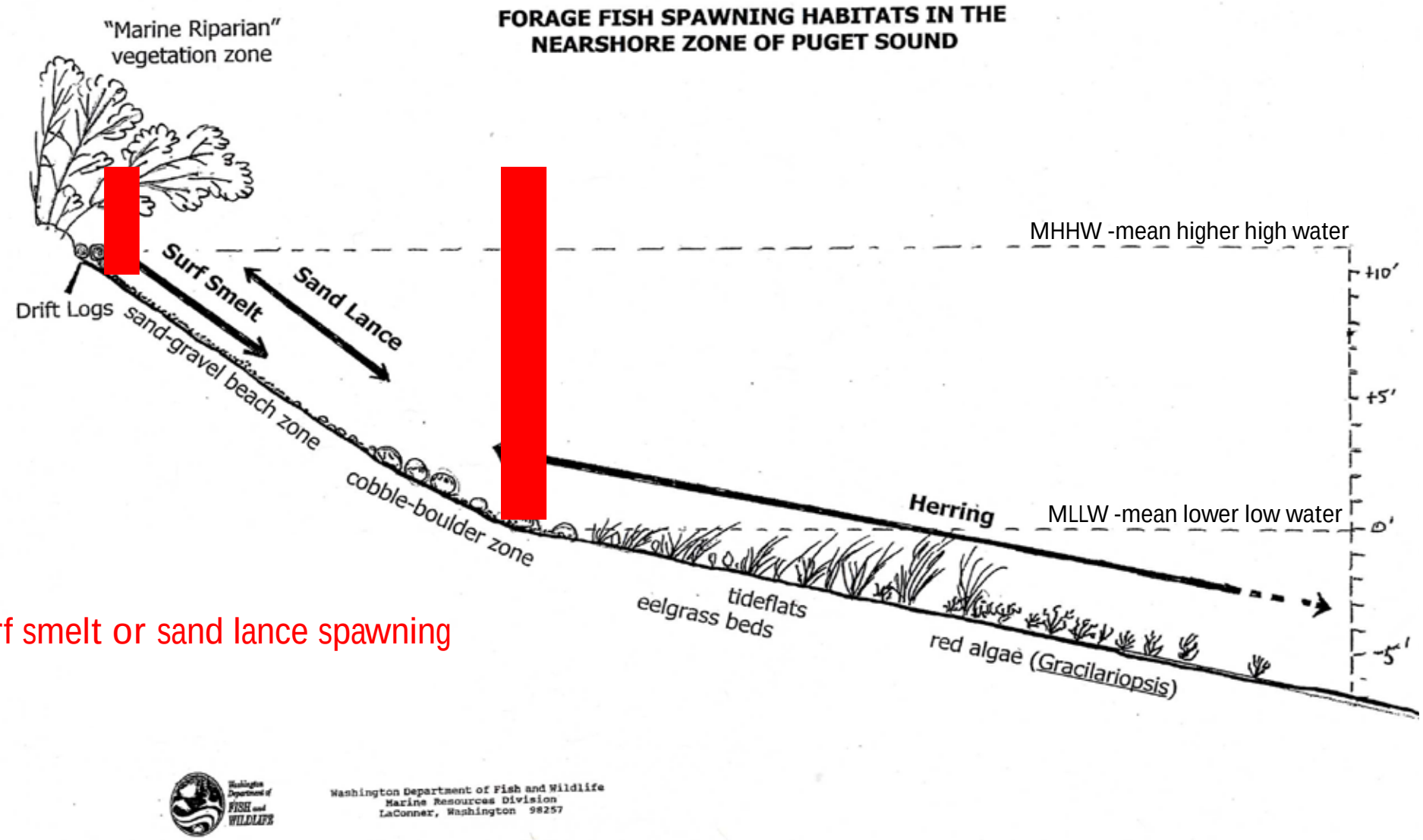

Bank
Backshore
Beach Face
Low Tide Terrace
PHOTIC ZONE
RIPARIAN ZONE
INTERTIDAL ZONE
SUBTIDAL ZONE
Nearshore
King County
Department of Natural Resources and Parks
Water and Land Resources Division

FORAGE FISH SPAWNING HABITATS IN THE NEARSHORE ZONE OF PUGET SOUND

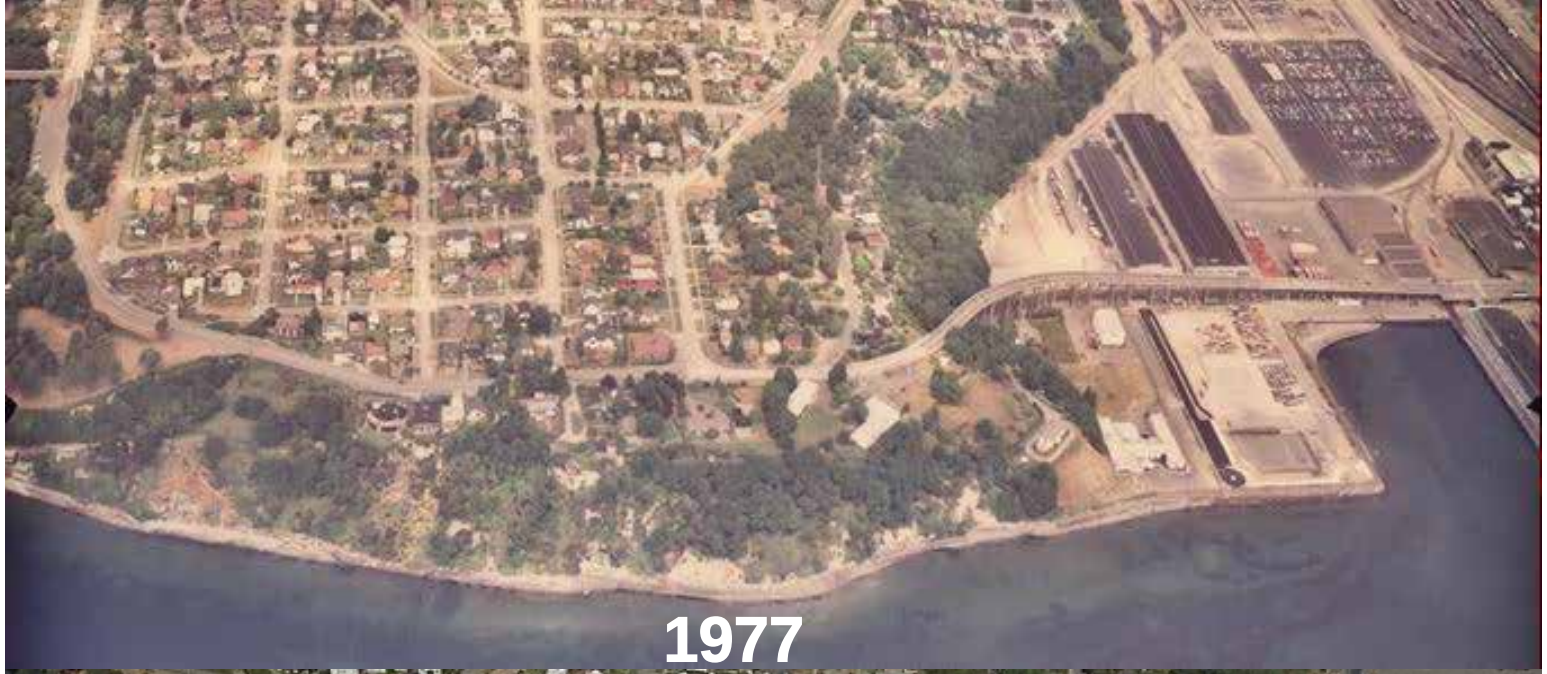


Washington Department of Fish and Wildlife
Marine Resources Division
LaConner, Washington 98257



No surf smelt or sand lance spawning


Armoring below High Water Line
reduces LWD and drift logs

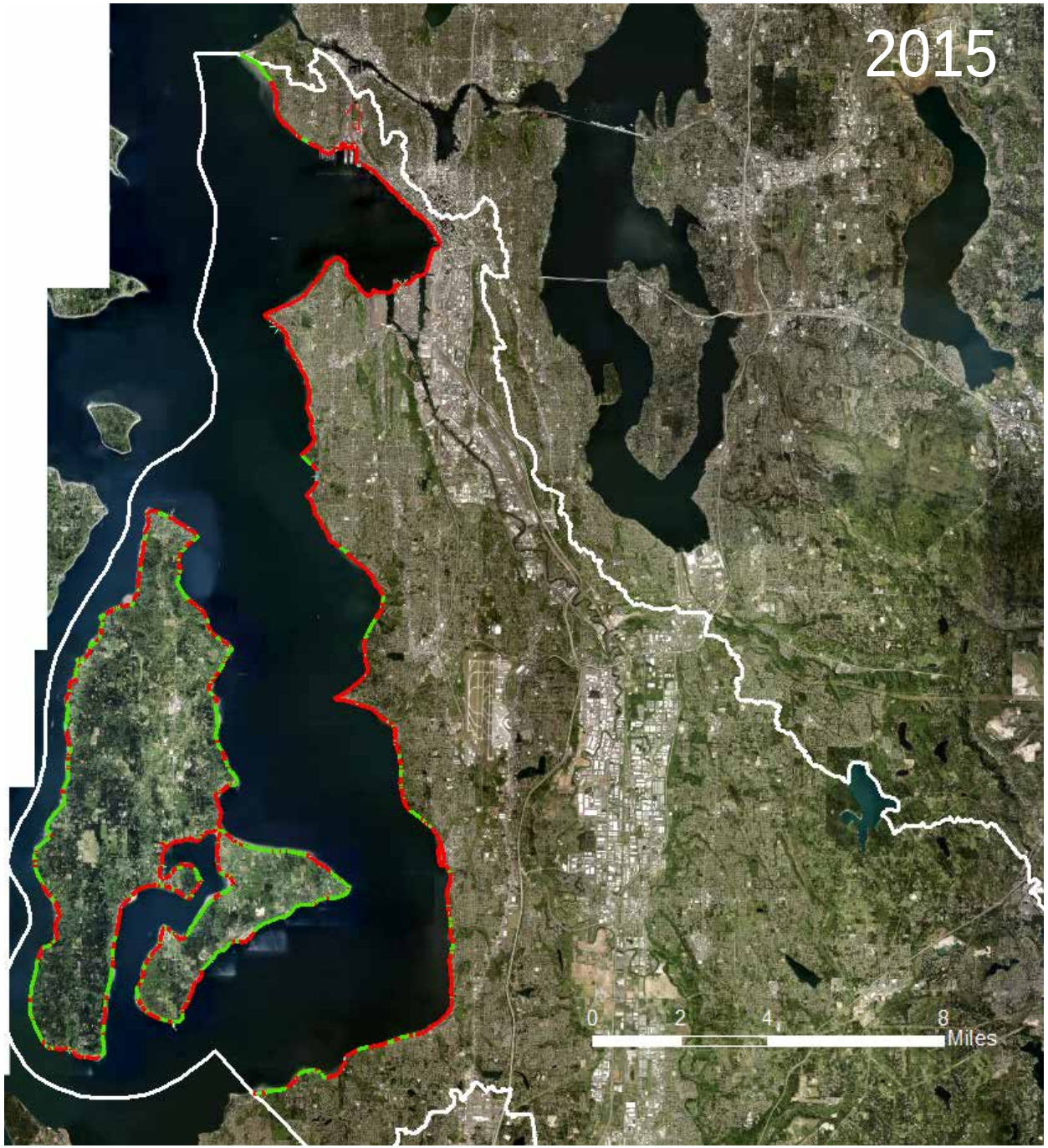

1977


2000

Filling/Armoring

- **Loss of shallow water (wood)**
- **Loss of riparian functions (vegetation)**
- **Changes in hydrology (sediment)**

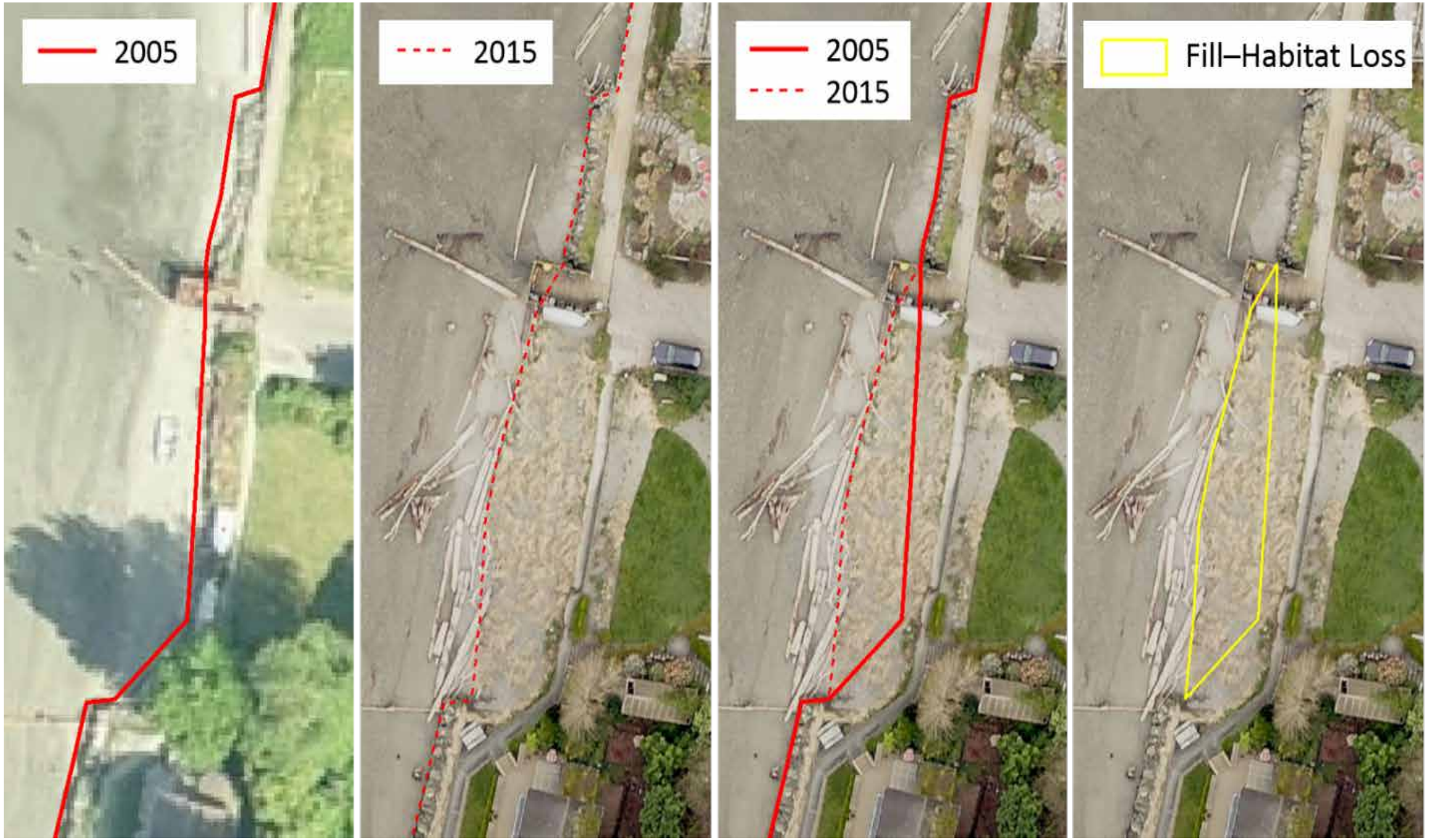
à Elimination of spawning, rearing and refuge habitat



92 miles shoreline
68% armored


Not Armored/Natural


N
0 100 200 400
Feet
Shoreline Condition
Armored/Modified
Not Armored/Natural


2005
2015
2005
2015
Fill–Habitat Loss

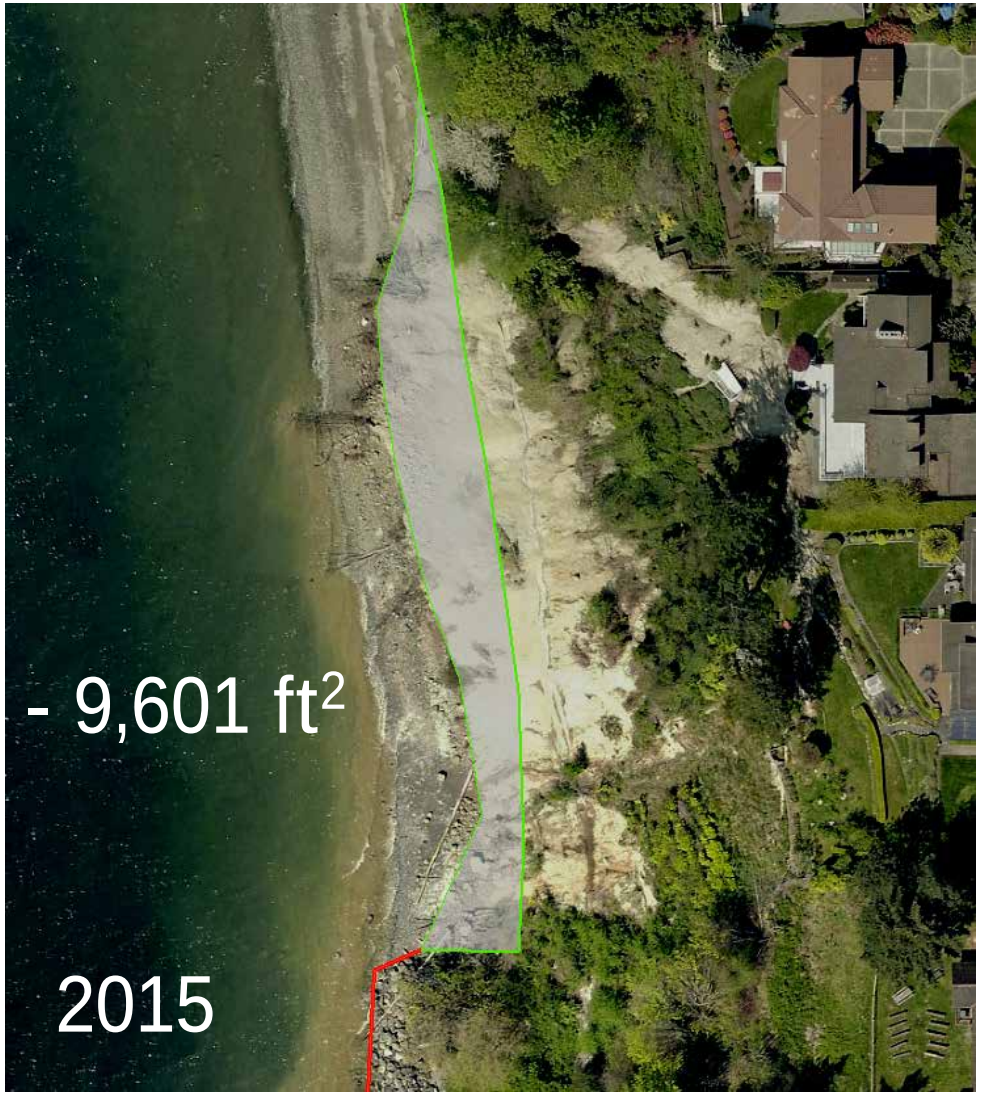
Seahurst Park

Olympic Sculpture Park

- Increase larval fish
- Increase juvenile salmon
- Increase juvenile feeding
- Higher invertebrate taxa

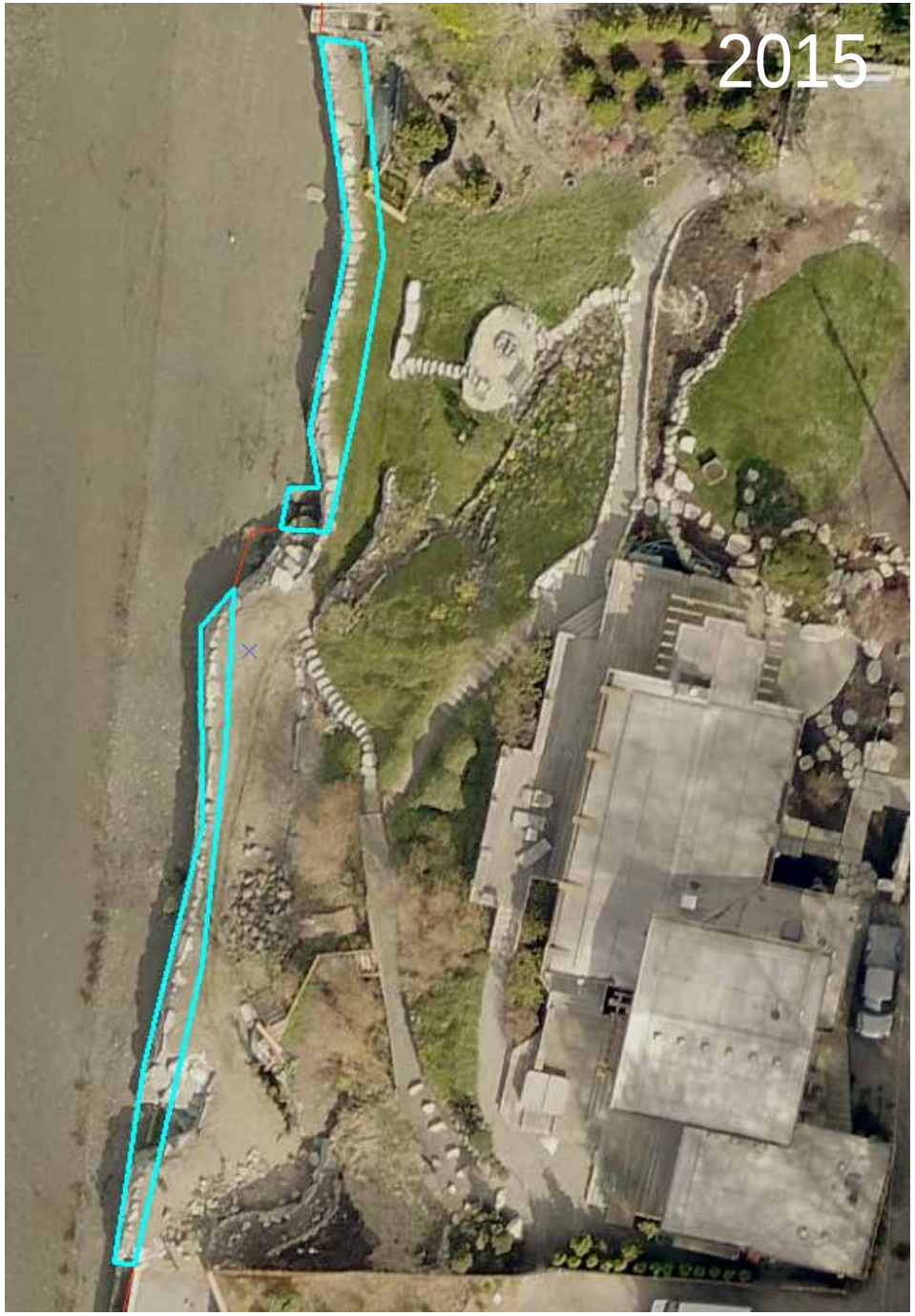
(Toft et al. 2013)

Landslide North of Saltwater Park



Fill

Fill



Fill

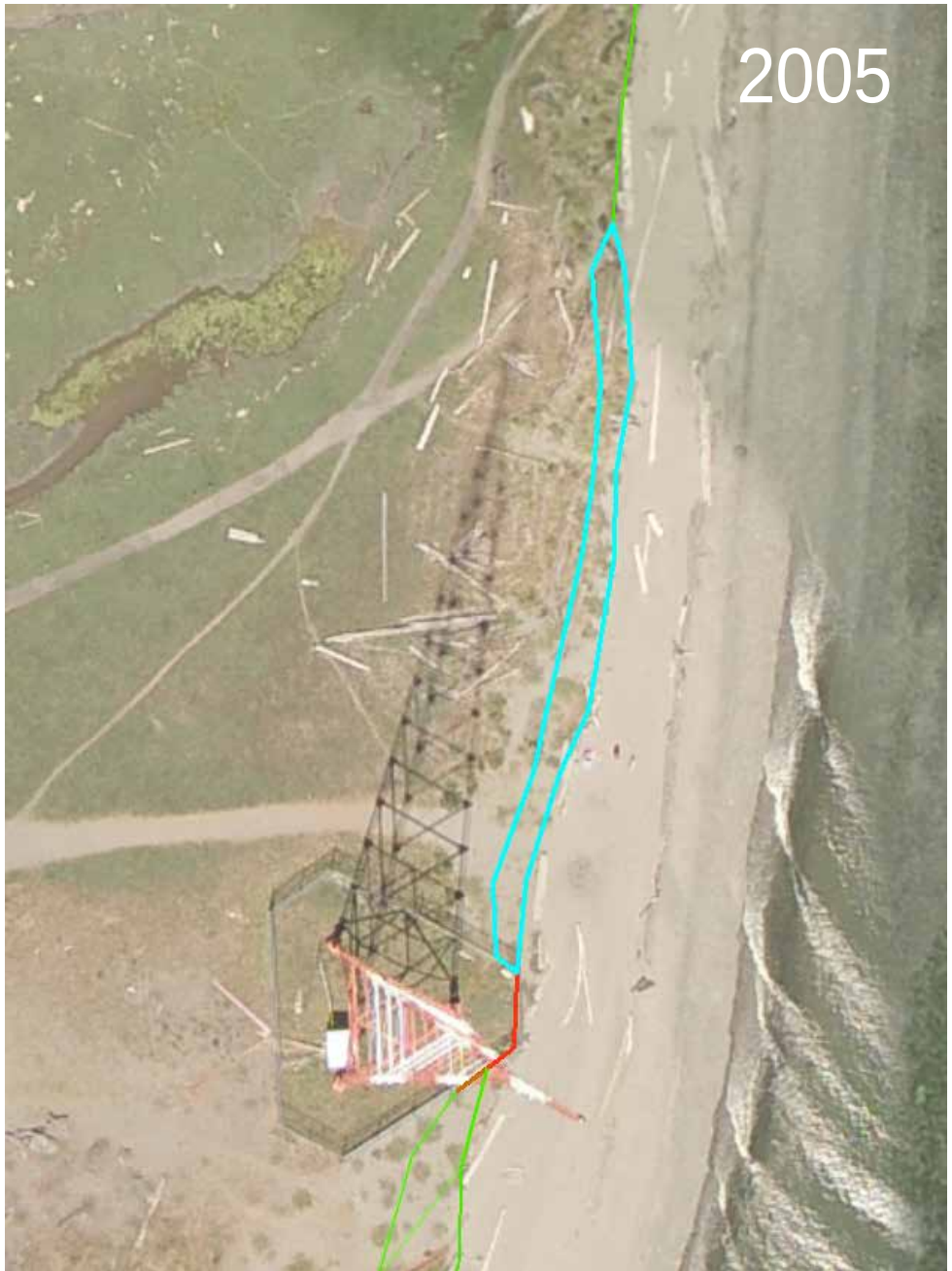
Fill

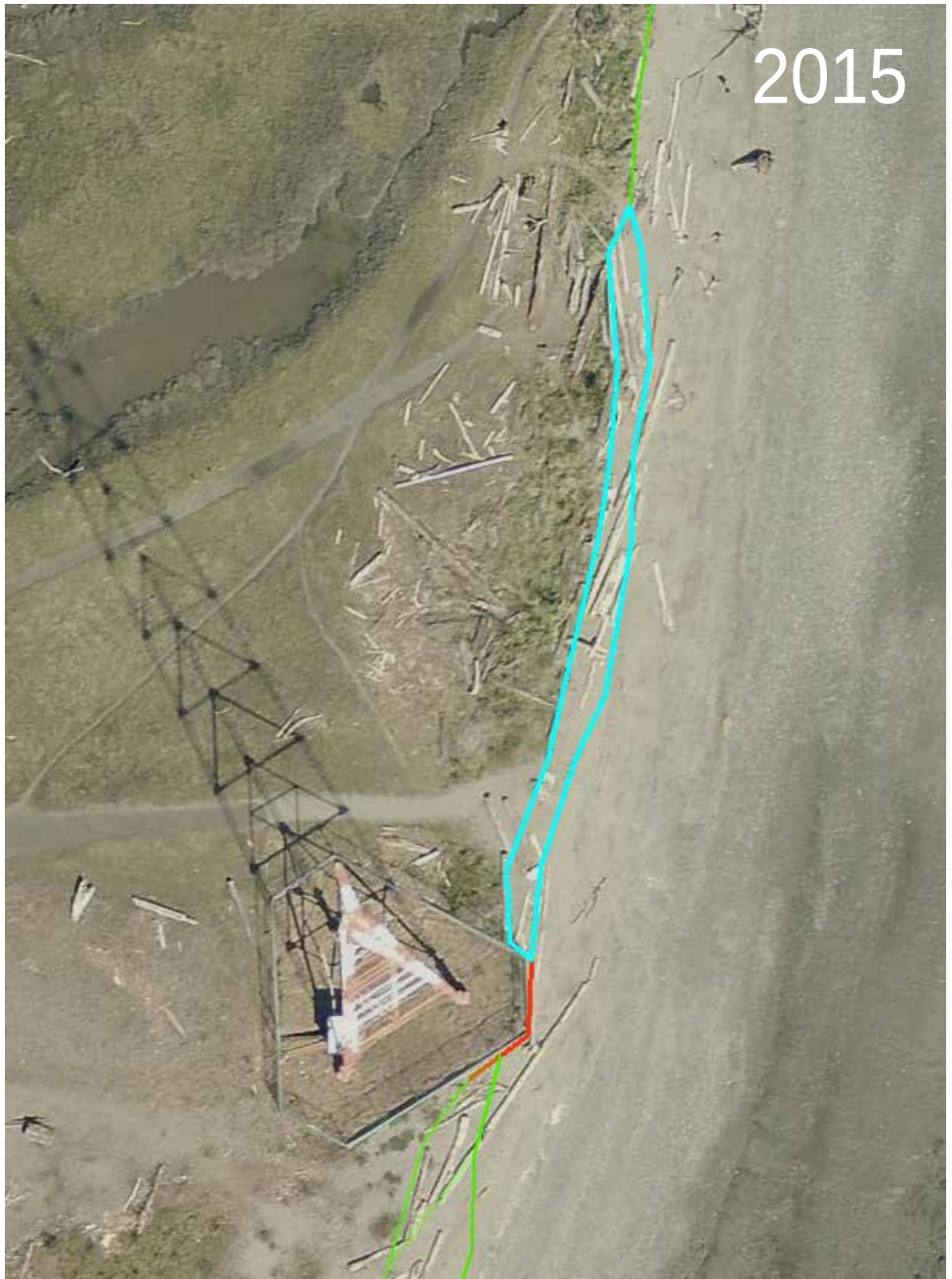
Fill


Erosion
2005


2015

Erosion

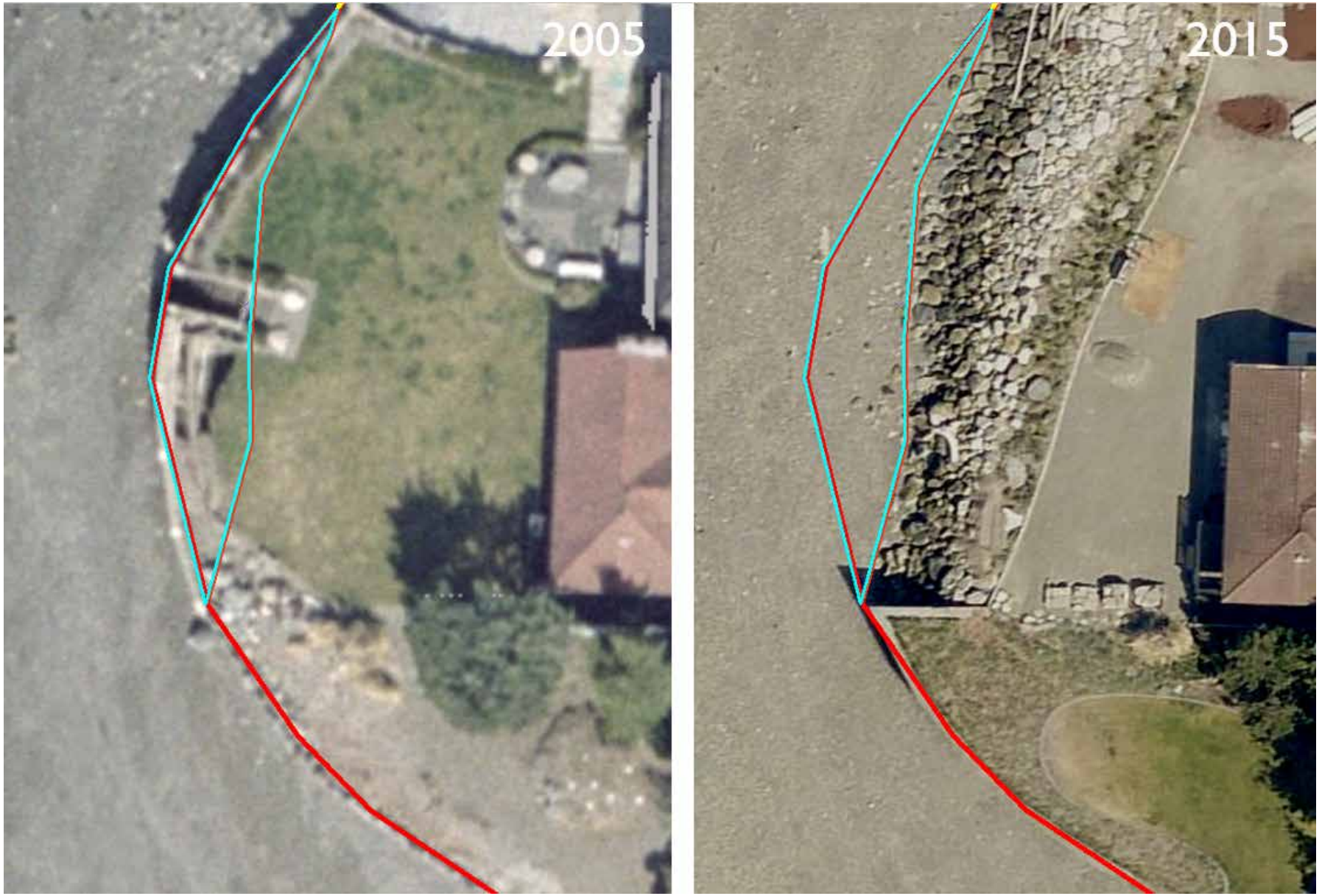




Erosion of landslide

Accretion

Removed Armor/Fill



Restoration

Results

	Anthropogenic Total (ft^2)		
Nearshore Gain		116,864	
	Removal of armor/fill		7,859
	Restoration		109,005
Nearshore Loss		-17,247	
	Fill		-7,403
	Rock fill		-9,660
	Dredging		-184
Net Gain		**99,617 ft^2**	


Seattle
Burien
Vashon
Normandy Park
Des Moines
Federal Way

Jurisdiction	Area Removed Armor/Fill (ft^2)	Number Removed Armor/Fill Sites	Area Added Armor/Fill (ft^2)	Number Added Armor/Fill Sites	Net Total (ft^2)	Shoreline Length (ft)
Burien	83,328	6	927	7	80,317	30,799
Seattle	18,717	4	9,018	28	15,094	118,000
Federal Way	3,098	1	-	-	3,982	26,718
Vashon	11,721	3	6,009	24	2,939	291,728
Des Moines	-	-	629	8	-629	20,698
Normandy Park	-	-	664	1	-664	32,211
WRIA 9	**116,864**	**14**	**17,247**	**68**	**99,617**	**520,154**

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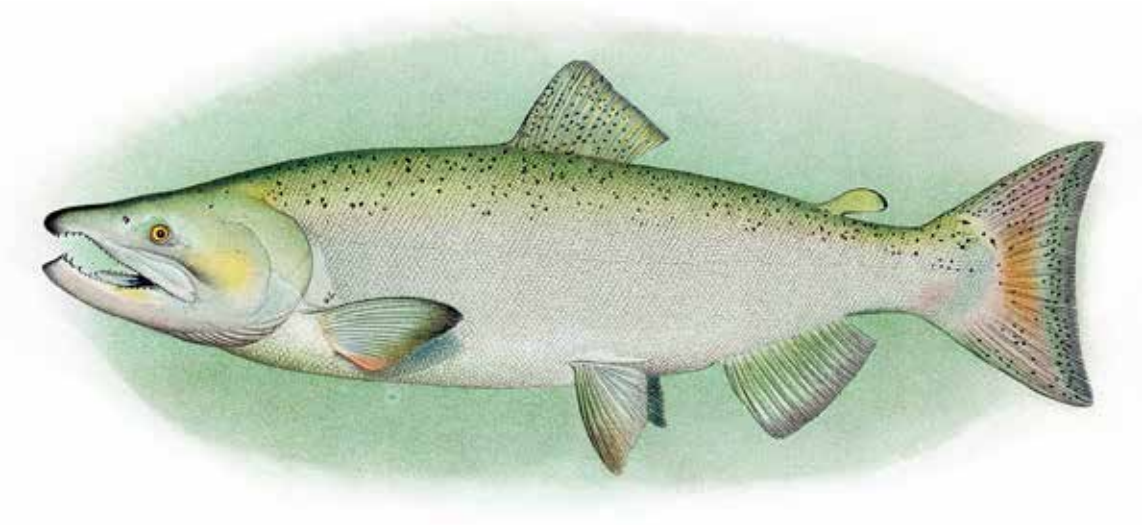
Seahurst Park, Burien

Olympic Sculpture Park, Seattle

Integrating Results in Salmon Habitat Plan Update

- Track shoreline and nearshore habitat changes
- Shoreline features
  1) Relative tidal elevation of the armor
  2) Armor condition
  3) Armor materials
  4) Overhanging vegetation
  5) Woody debris
  6) Houses (septic systems, distance to OHW, etc.)



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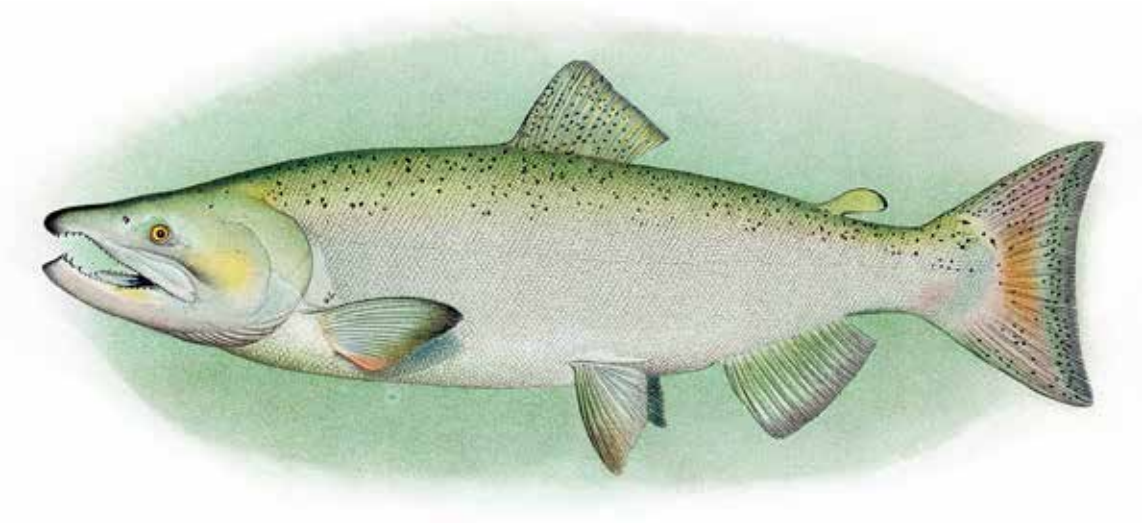

- Are we meeting our restoration goals?
- Do we want to change strategies and policies?

Questions?

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